GRADE 12 DIPLOMA EXAMINATION

Mathematics 30

January 1992

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
MATHEMATICS 30

DESCRIPTION

Time allotted: 2½ hours

Total possible marks: 67

This is a **closed-book** examination consisting of **three** parts:

PART A has 40 multiple-choice questions each with a value of one mark.

PART B has seven numerical-response questions each with a value of one mark.

PART C has four written-response questions for a total of 20 marks.

A tear-out formula sheet, z-score page, and 90% Box Plots are included in this booklet.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

GENERAL INSTRUCTIONS

Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.

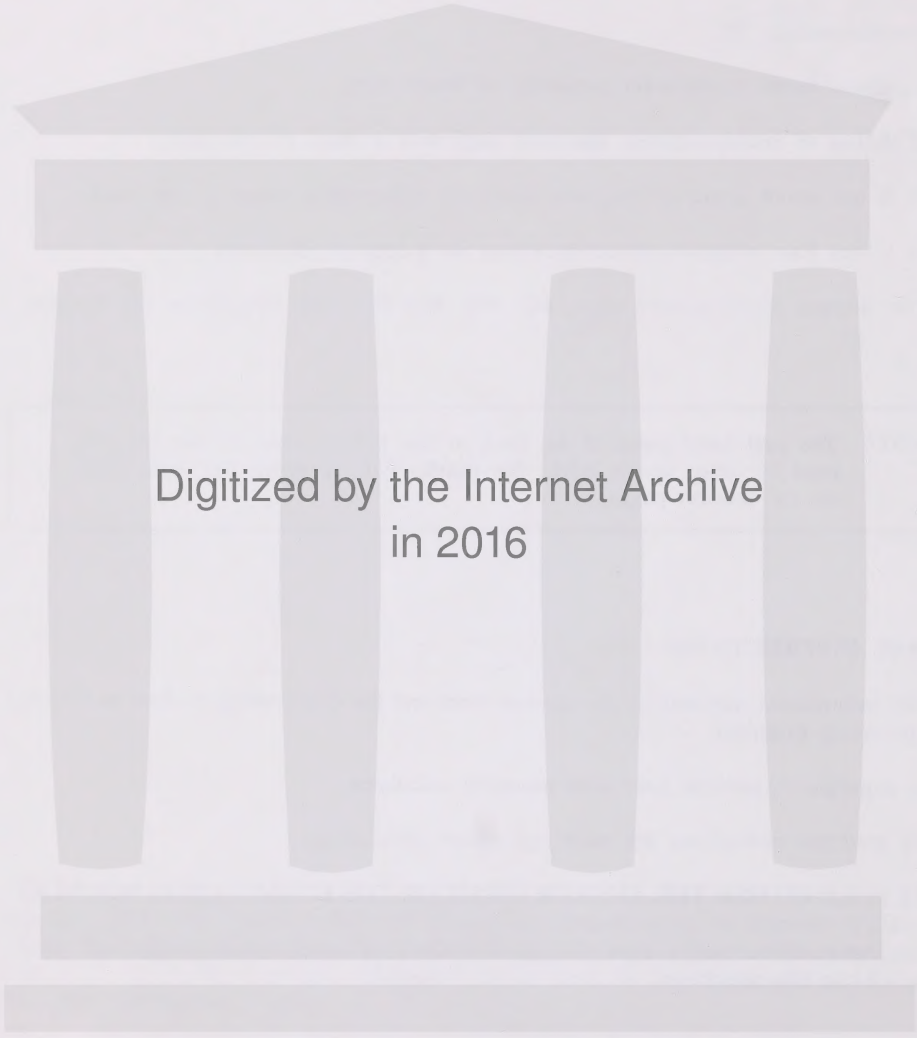
You are expected to provide your own scientific calculator.

Carefully read the instructions for each part before proceeding.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

JANUARY 1992



PART A

INSTRUCTIONS

In this part of the examination, there are 40 multiple-choice questions each with a value of one mark. All numbers used in the questions are to be considered as **exact** numbers and are not the result of a measurement.

Read each question carefully and decide which of the choices **best** completes the statement or answers the question. Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice. **Use an HB pencil only**.

Example **Answer Sheet**

This diploma examination is for the subject of Ⓐ Ⓑ Ⓒ ●

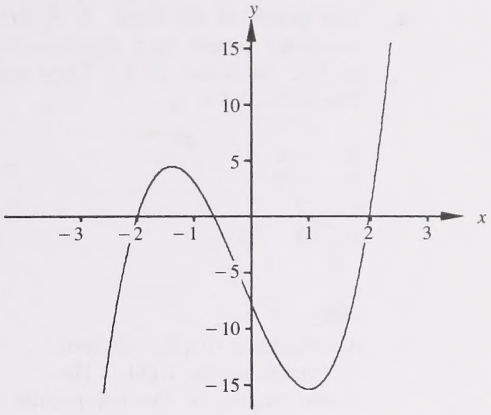
A. biology
B. physics
C. chemistry
D. mathematics

If you wish to change an answer, erase your first mark completely.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.

1. Monique was asked to find the roots of $P(x) = 0$. She graphed $y = P(x)$ on her computer. The graph of $P(x)$ is shown at the right. The roots of $P(x) = 0$ are



A. $2, -2, -\frac{2}{3}$

B. $2, -2, \frac{2}{3}$

C. $2, 2, -\frac{3}{2}$

D. $2, -2, -\frac{3}{2}$

2. If $P(x) = 2x^3 - x^2 - 15x + k$ and $P(2) = 0$, then the factorization of $P(x)$ is

A. $(x - 2)(x + 3)(x - 18)$
B. $(x - 2)(x + 3)(2x - 3)$
C. $(x + 2)(x + 3)(2x + 3)$
D. $(x + 2)(x + 3)(2x - 3)$

3. Frederik used a calculator to graph a fourth-degree polynomial function that has only three x-intercepts: $\frac{1}{2}$, -3, and 2. One possible factored form of the polynomial that Frederik graphed is

A. $x(x + \frac{1}{2})(x - 3)(x + 2)$

B. $x(x - \frac{1}{2})(x + 3)(x - 2)$

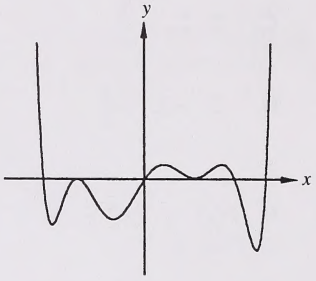
C. $(2x + 1)(x - 3)(x + 2)^2$

D. $(2x - 1)(x + 3)(x - 2)^2$

4. The graph of the form $y = k(x - 3)^2(x + 1)(x - 1)$ is displayed on a computer screen in a Mathematics 30 classroom. The students are asked to find the value of k. They notice that the graph has a y-intercept of 18. The value of k is

A. -6
B. -2
C. 2
D. 6

5. A calculator display showed the graph at the right. The lowest degree of the polynomial represented by the graph is



A. 5
B. 6
C. 7
D. 8

6. If $2x^3 + kx^2 - mx - 5$ is divided by $x - 3$, the remainder is 6. The equation relating k and m is

A. $9k - 3m = -49$
B. $9k - 3m = -43$
C. $9k + 3m = 59$
D. $9k + 3m = 65$

7. An integral polynomial function must have integral

A. zeros
B. coefficients
C. coefficients and zeros
D. x- and y-intercepts

8. If $\cos\theta = -0.80$, $\pi < \theta < \frac{3\pi}{2}$, then $\sec\theta$ is

A. -1.67
B. -1.25
C. 1.25
D. 1.67

9. A simplified form of $\sin^2 \theta + \cos^2 \theta + \cot^2 \theta$ is

A. $-\sec^2 \theta$

B. $-\csc^2 \theta$

C. $\sec^2 \theta$

D. $\csc^2 \theta$

10. The expression $\dfrac{\cot^2 A}{\csc^2 A}$ is equivalent to

A. $\dfrac{\sin^4 A}{\cos^2 A}$

B. $\dfrac{\cot A}{1 + \cot A}$

C. $\cos^2 A$

D. $2 \tan^2 A$

11. If $f(x) = 4 \sin x + 1$, $0 \leqq x < 360°$, then the x-intercepts of the function correct to the nearest tenth of a degree are

A. 14.5°, 345.5°

B. 165.5°, 194.5°

C. 194.5°, 345.5°

D. 255.5°, 345.5°

12. If $\cos \theta = \dfrac{3}{4}$ or $\cos \theta = -\dfrac{1}{2}$, then the value of N in the equation $M \cos^2 \theta + N \cos \theta - 3 = 0$ is

A. -4
B. -2
C. 2
D. 4

13. If $2 \sin^2 \theta - \sin \theta - 1 = 0, 0 < \theta \leqq 2\pi$, then θ equals

A. $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}$

B. $\frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

C. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

D. $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

14. If the graph of $y = \sin(2\theta)$ is shifted $\frac{\pi}{6}$ units to the right, then it can be represented by

A. $y = \sin\left(2\theta - \frac{\pi}{3}\right)$

B. $y = \sin\left(2\theta + \frac{\pi}{3}\right)$

C. $y = \sin(2\theta) + \frac{\pi}{6}$

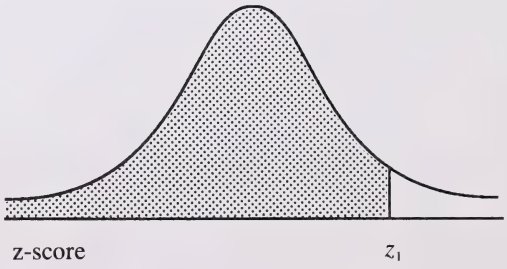
D. $y = \sin(2\theta) - \frac{\pi}{6}$

15. The mean of 10 scores is 12.5 and the standard deviation is 2.6. If 5.0 is added to each score, then the mean will be

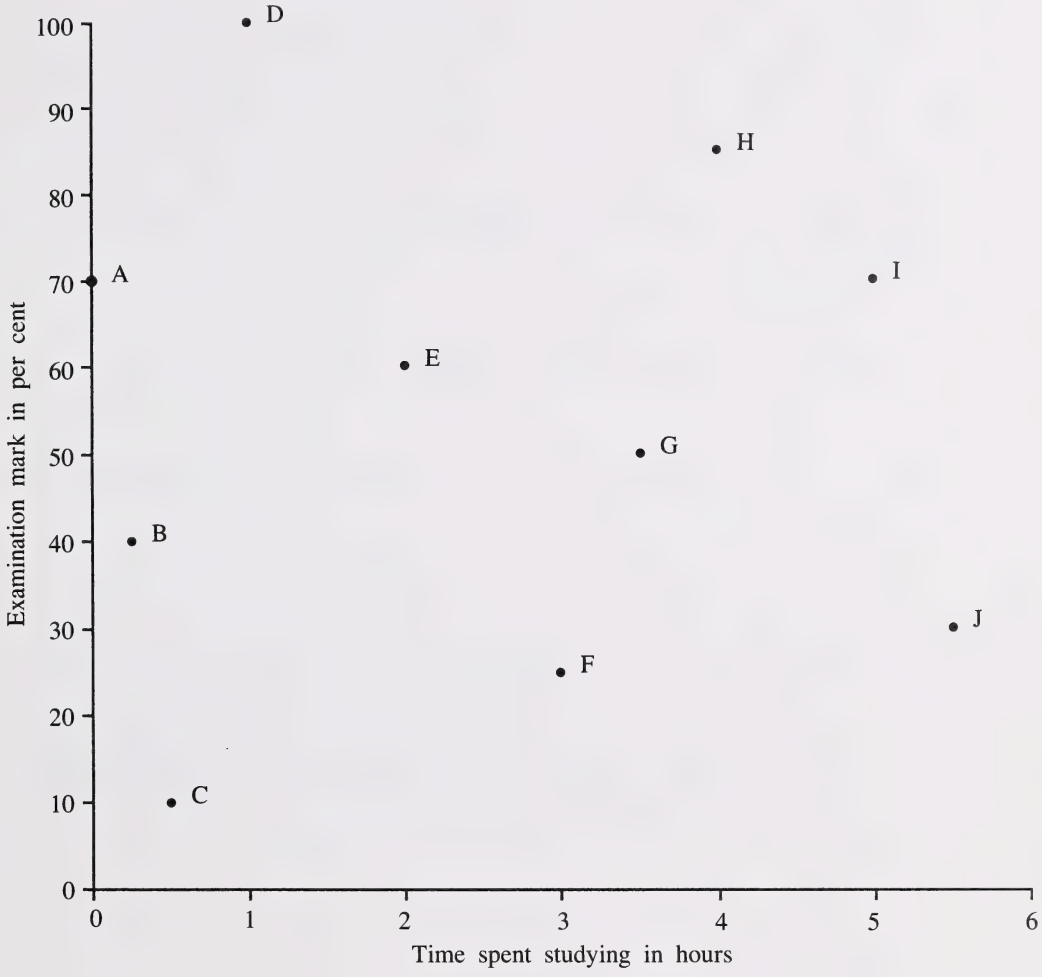
A. 12.5
B. 13.0
C. 14.5
D. 17.5

16. In the standard normal distribution at the right, the shaded area is 0.9608. The value of z_1 is

A. 0.46
B. 0.48
C. 1.76
D. 2.06



17. The examination mark received by each of 10 students and the amount of time each student spent studying are shown on the scatter plot below. The students are represented by the letters A to J.



Using the information obtained from the scatter plot, one could say that the time spent studying

A. correlates not obviously with the examination mark received
B. correlates positively with the examination mark received
C. correlates strongly and positively with the examination mark received
D. correlates negatively with the examination mark received

18. The results of an achievement test were normally distributed with a standard deviation of 15.0. If a student is selected at random, the probability is 0.0485 that his mark will exceed 85. The mean for this test correct to the nearest tenth is

A. 63.8
B. 62.4
C. 61.0
D. 60.1

19. The length of the confidence intervals increases as the

A. sample size decreases
B. sample size increases
C. length of the questionnaire increases
D. length of the questionnaire decreases

20. In a random sample of size 20 from a population with 50% yeses, a likely sample proportion would be

A. 0.24
B. 0.45
C. 0.73
D. 0.82

21. At least 35% and no more than 55% of the population is expected to respond ''yes'' on a survey of sample size 40. The number of people that could be expected to say ''yes'' on the survey is

A. 8
B. 18
C. 28
D. 38

22. A cone with a circular base is intersected by a plane that is neither parallel to nor perpendicular to the axis of the cone. The plane does **not** intersect the base of the cone. The shape of the conic section formed is

A. a circle
B. a parabola
C. an ellipse
D. a hyperbola

23. If $Ax^2 + Cy^2 - 1 = 0$ represents a circle, and $A = \frac{1}{m}$, then

A. $C < \frac{1}{m}$

B. $C > \frac{1}{m}$

C. $C = \frac{1}{m}$

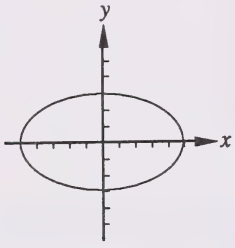
D. $C = 0$

24. An object moves along a path such that the sum of the distances from two fixed points is constant. The path of the object can be described as

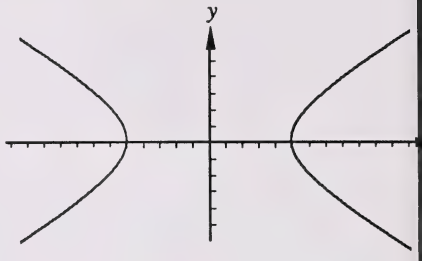
A. a circle
B. an ellipse
C. a parabola
D. an hyperbola

25. Ahmed is asked to draw the graph of a conic that has an eccentricity of one. Ahmed's graph could be

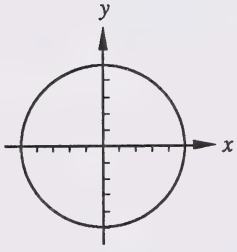
A.



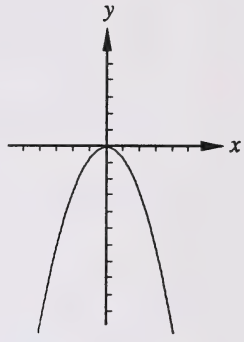
B.



C.



D.



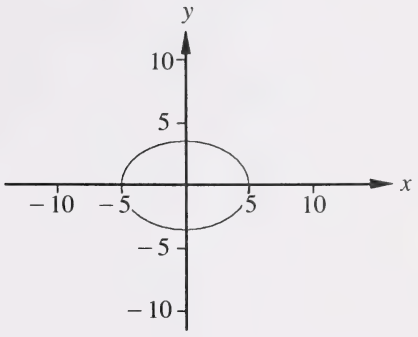
26. Yui Lin is sketching the graph of a conic. First she plots a point P at (6, 0). Then she plots two other points on the conic, Q (9, 4) and R (9, -4). What additional information does Yui Lin need in order to know whether the conic will be a hyperbola or a parabola?

A. The line $y = 0$ is the axis of symmetry
B. The line $x = 6$ is tangent to the curve
C. The domain of the relation
D. The range of the relation

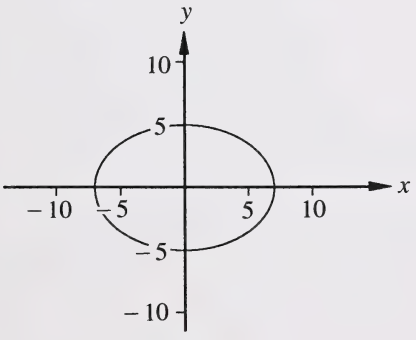
27. The equation $x - y = 0$ is the **complete** equation of a degenerate

A. hyperbola
B. ellipse
C. parabola
D. circle

28. The graph of $Ax^2 + Cy^2 + Dx + Ey + F = 0$, $F = -25$, is shown at the right. If the value of F is changed from -25 to -49, **and no other changes are made,** the graph will look like



A.



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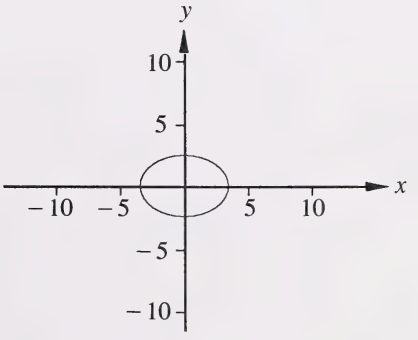

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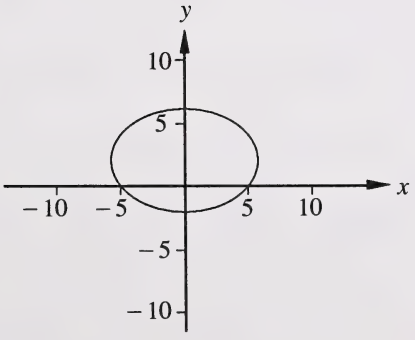
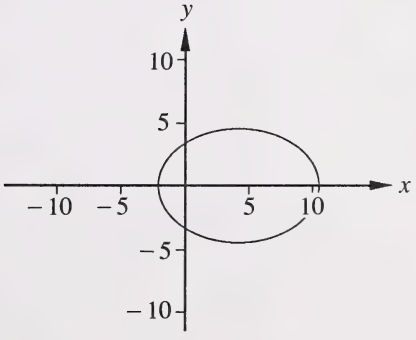
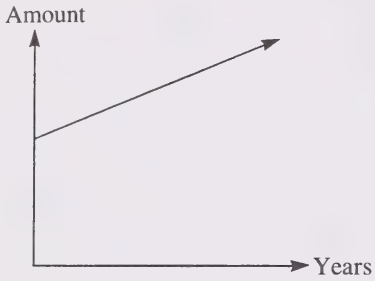


D.

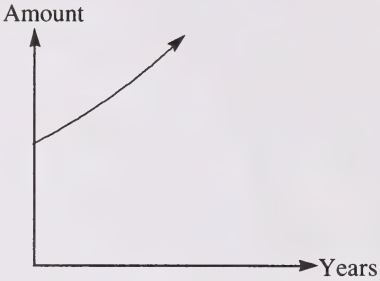


29. A radioactive substance decays exponentially so that after four years, half of its original amount remains. The graph that **best** represents this relation is

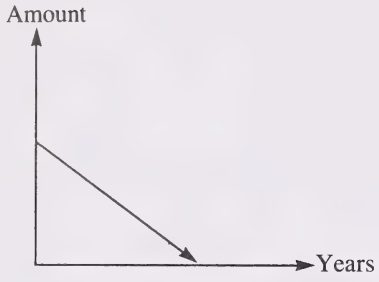
A.



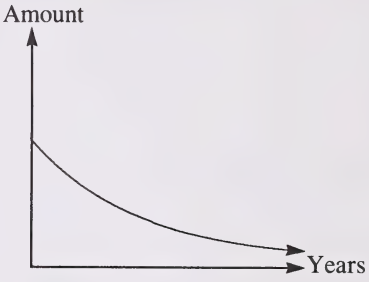
B.



C.



D.



30. An expression equivalent to $\log_5[(8)(9)]$ is

A. $2 \log_5(2) + 3 \log_5(3)$

B. $3 \log_5(2) + 2 \log_5(3)$

C. $[2 \log_5(2)][3 \log_5(3)]$

D. $[3 \log_5(2)][2 \log_5(3)]$

31. For the arithmetic sequence $\log_a(3)$, $\log_a(9)$, $\log_a(27)$, . . . , the common difference is

A. 3

B. 6

C. $\log_a(3)$

D. $\log_a(6)$

32. If $\log_{10}(x - 2) + \log_{10}(x + 7) = 1$, then the value of x correct to the nearest tenth is

A. 2.0
B. 2.1
C. 2.5
D. 3.0

33. An exponential form equivalent to $x \log_a(2) = 5$ is

A. $2^x = a^5$

B. $2^x = 5^a$

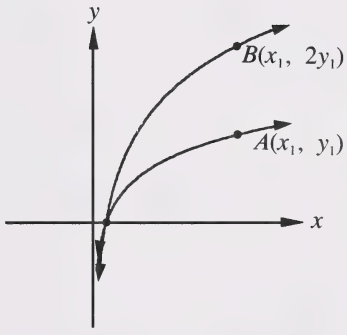
C. $x^2 = a^5$

D. $x^2 = 5^a$

34. If $\log_2(256) = x + y$ and $\log_8(64) = x - y$, then the value of y is

A. 3
B. 5
C. 96
D. 160

35. In the diagram at the right, A is on the graph of $y = \log_7(x)$ and B is on the graph of



A. $y = \log_7(2x)$

B. $y = \log_7(x^{1/2})$

C. $y = \log_7(x^2)$

D. $y = (\log_7 x)^2$

36. Concert organizers are determining the order in which the school bands from Fort McMurray, Grande Prairie, Lethbridge, Red Deer, and Medicine Hat will perform. The number of ways to arrange the order in which the bands will perform if Red Deer performs first is

A. 4
B. 20
C. 24
D. 120

37. Martha wants to use the digits 2, 3, 4, and 5 for her personal banking identification number. If repetitions are allowed, how many different four-digit numbers can she create?

A. 256
B. 120
C. 24
D. 16

38. At the end of May, John gave his mother \$50 for safekeeping. Every month thereafter, he gave his mother \$25 more than he did the previous month. How much money is John's mother holding for him after John gives her his money at the end of December?

A. \$1100
B. \$1250
C. \$1300
D. \$1450

39. The first prize in a lottery is \$1000. Each succeeding prize pays $\frac{1}{3}$ as much as the prize before it. If 10 prize tickets are drawn, then the total amount to be paid out, correct to the nearest dollar, is

A. \$1500
B. \$1667
C. \$1750
D. \$2000

40. For the series defined by $\sum_{n=3}^{8} 4(-2)^n$, the fourth term, t_4, is

A. -512
B. -128
C. 256
D. 64

YOU HAVE NOW COMPLETED PART A. PROCEED DIRECTLY TO PART B.

PART B

INSTRUCTIONS

In this part of the examination, there are seven numerical-response questions each with a value of one mark. All numbers used in the questions are to be considered as **exact** numbers and are not the result of a measurement.

Read each question carefully.

Record your answer on the answer sheet provided by writing it in the boxes and filling in the corresponding circles.

Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.

Use an HB pencil only.

Sample Questions and Solutions

Answer Sheet

1. If θ is acute and $\sin \theta = 0.6735$, then the measure of θ correct to the nearest tenth of a degree is _____ .

   $\theta = 42.33777464...°$

   RECORD 42.3

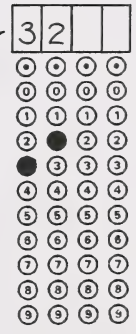
2. For the arithmetic series $-8 + (-5) + (-2) + \ldots + (85)$, the number of terms is _____ .

   $85 = -8 + (n - 1)(3)$

   $93 = 3n - 3$

   $n = 32$

   RECORD 32



If you wish to change an answer, erase **all** traces of your first answer.

START PART B IMMEDIATELY.

1. If $x^{10} - 8x + 3$ is divided by $x + 1$, then the remainder is _____ .

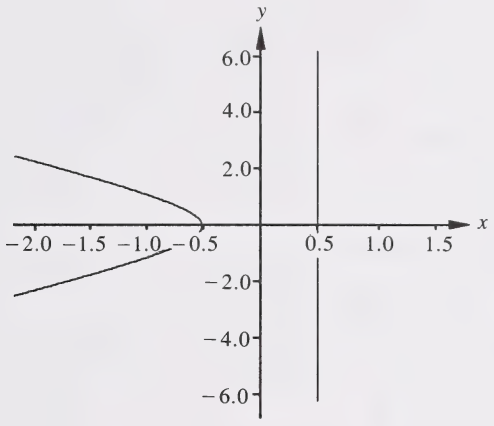
RECORD THE ANSWER ON THE ANSWER SHEET

2. Correct to the nearest tenth of a radian, an angle of 130° is equivalent to _____ .

RECORD THE ANSWER ON THE ANSWER SHEET

3. The number of minutes that a quarterback plays in a game is normally distributed with a mean of 29.3 minutes and a standard deviation of 2.5 minutes. Correct to the nearest per cent, the probability that the quarterback will play between 24.7 minutes and 31.2 minutes per game is _____ .

4. The eccentricity is the ratio of the distance between a point on the graph and the fixed point to the distance between the same point and the fixed line. Shown below is the partial graph of a hyperbola with a point on the graph at $(-\frac{1}{2}, 0)$, a fixed point (focus) at $(-2, 0)$, and a fixed line (directrix) at $x = \frac{1}{2}$.



Correct to the nearest tenth, the eccentricity of this conic is _____ .

5. The number of bacteria in a test tube is determined by the function $N(t) = N_o(2)^{\frac{t}{d}}$, where N_o is the initial number of bacteria and d is the doubling time. A scientist began with 100 bacteria and estimates that there are 5000 bacteria immediately after 12 h. The doubling time correct to the nearest tenth of a hour is _____ .

6. One of the terms in the expansion of $\left(2x + \frac{1}{x}\right)^5$ is of the form kx^3. Correct to the nearest tenth, the value of k is _____ .

RECORD THE ANSWER ON THE ANSWER SHEET

7. The first three terms of an arithmetic sequence are $19 - x$, $3x$, and $4x - 1$. Correct to the nearest tenth, the numerical value of the second term of this sequence is _____ .

YOU HAVE NOW COMPLETED PART B. PROCEED DIRECTLY TO PART C.

PART C

INSTRUCTIONS

In this part of the examination, there are four written-response questions for a total of 20 marks. All numbers used in the questions are to be considered as **exact** numbers and are not the result of a measurement.

Read each question carefully.

Write your answer in the examination booklet as neatly as possible.

For full marks, your answer **must show** all pertinent explanations, calculations, and formulas. Your answer **should be** presented in a well organized and appropriate manner.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

START PART C IMMEDIATELY.

FOR DEPARTMENT USE ONLY

(5 marks)

1. For the high school basketball game, 4 cheerleaders are working on a special routine.

   a. In how many ways can the 4 cheerleaders arrange themselves in a row?

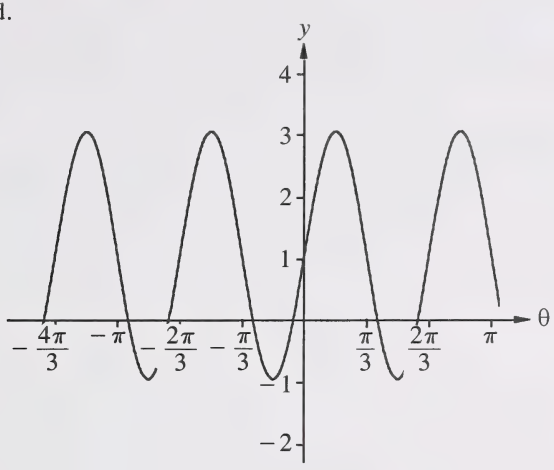
   b. In how many ways can the 4 cheerleaders arrange themselves in a circle?

   c. Explain why there are more ways for the 4 cheerleaders to arrange themselves in a row than in a circle.

FOR DEPARTMENT USE ONLY

2. Grace was given this graph of a trigonometric function in the form $y = a \sin(b\theta) + d$ and was asked to find the range, the amplitude, and the period.

(5 marks)



Grace determined from the graph that the range is $\theta \in R$, the amplitude is 4, and the period is $\frac{2\pi}{3}$.

State whether you agree or disagree with each of Grace's answers and indicate why.

FOR DEPARTMENT USE ONLY

(5 marks)

3. **a.** Find the nth term, t_n, of a sequence where the first term, t_1, is 6; the second term, t_2, is 12; and the third term, t_3, is 24.

b. A sequence different from the one in part (a) has a first term, t_1, of 6 and a third term, t_3, of 24. Find the nth term, t_n.

FOR DEPARTMENT USE ONLY

4. The Ice Haven Company wants to introduce a new frozen dessert and plans to do a survey to determine what type of dessert would be most popular. The company has advertised for a high school student to design the survey. Each applicant is to submit a short proposal suggesting how the population should be described, how a sample of the chosen population should be selected, and how the survey should be conducted.

You are one of the applicants. Write a proposal, in paragraph form, to the Ice Haven Company. Justify your suggestions.

(5 marks)

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

MATHEMATICS 30 FORMULA SHEET

The following information may be useful in writing this examination.

I. Polynomial Functions

- $P(x) = D(x)Q(x) + R$
- The roots of a quadratic equation are $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

II. Trigonometry

- arc length $a = r\theta$
- $\sec A = \dfrac{1}{\cos A}$
- $\csc A = \dfrac{1}{\sin A}$
- $\cot A = \dfrac{\cos A}{\sin A}$
- $\sin^2 A + \cos^2 A = 1$
- $1 + \tan^2 A = \sec^2 A$
- $1 + \cot^2 A = \csc^2 A$
- $\sin(A + B) = \sin A \cos B + \cos A \sin B$
- $\sin(A - B) = \sin A \cos B - \cos A \sin B$
- $\cos(A + B) = \cos A \cos B - \sin A \sin B$
- $\cos(A - B) = \cos A \cos B + \sin A \sin B$

III. Statistics

- $z = \dfrac{x - \mu}{\sigma}$
- $y = mx + b$

IV. Quadratic Relations

- $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$
- $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- eccentricity $e = \dfrac{|\overline{PF}|}{|\overline{PD}|}$, where F = focus,
  D = directrix, and
  P = point on the conic

V. Permutations and Combinations

- $n! = n(n - 1)(n - 2)\ldots(3)(2)(1)$
- ${}_nP_r = \dfrac{n!}{(n - r)!}$
- ${}_nC_r = \dfrac{n!}{r!(n - r)!}$
- $(x + y)^n = {}_nC_0x^n + {}_nC_1x^{n-1}y + {}_nC_2x^{n-2}y^2 + \ldots + {}_nC_kx^{n-k}y^k + \ldots + {}_nC_ny^n$

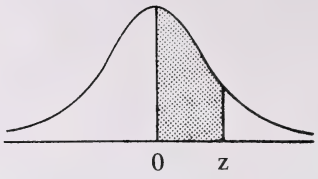
General Term

$$t_{k+1} = {}_nC_kx^{n-k}y^k$$

VI. Sequences and Series

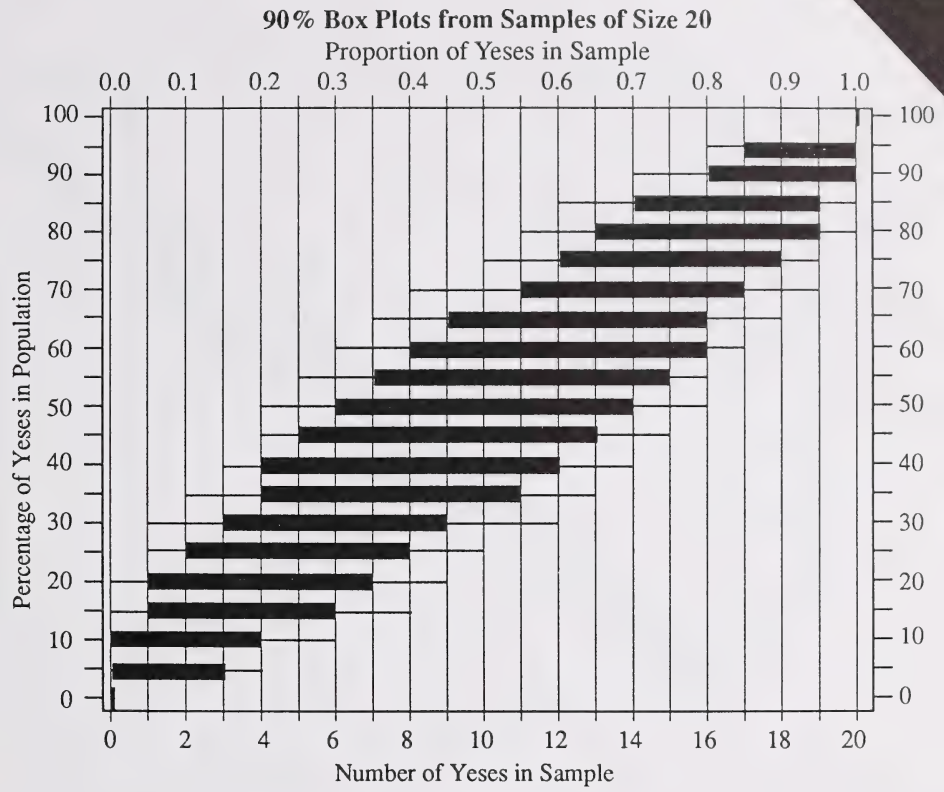
- $t_n = a + (n - 1)d$
- $S_n = \dfrac{n(a + t_n)}{2}$
- $S_n = \dfrac{n[2a + (n - 1)d]}{2}$
- $t_n = ar^{n-1}$
- $S_n = \dfrac{a(r^n - 1)}{r - 1}, r \neq 1$

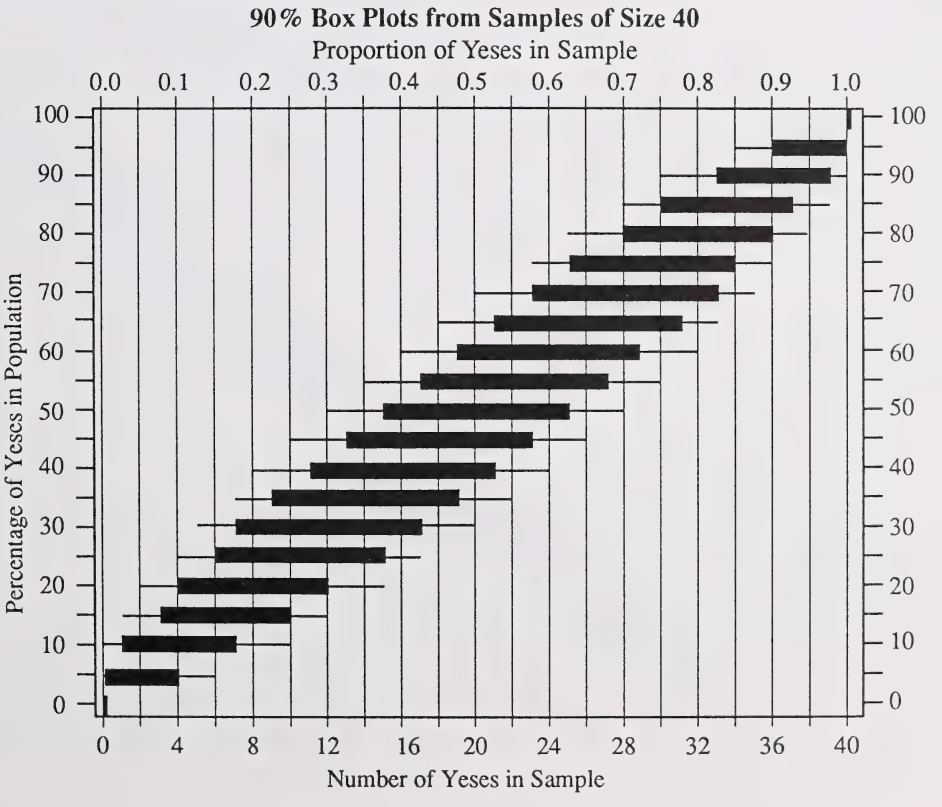
FOLD AND TEAR ALONG PERFORATION



AREAS UNDER THE STANDARD NORMAL CURVE

z	0	1	2	3	4	5	6	7	8	9
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0754
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000





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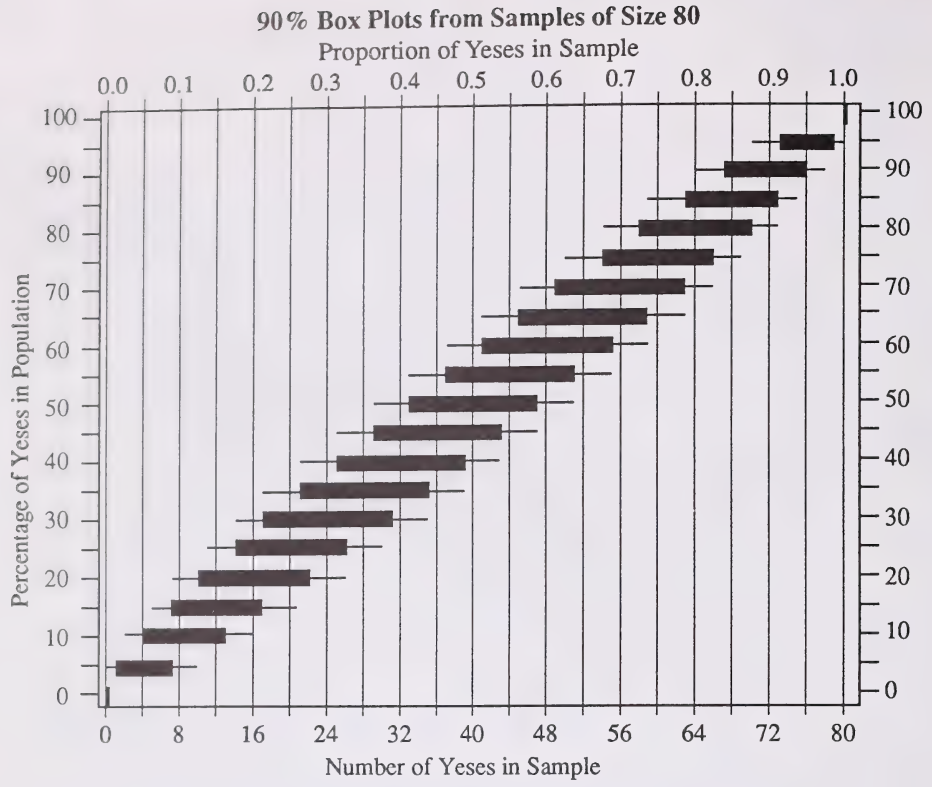
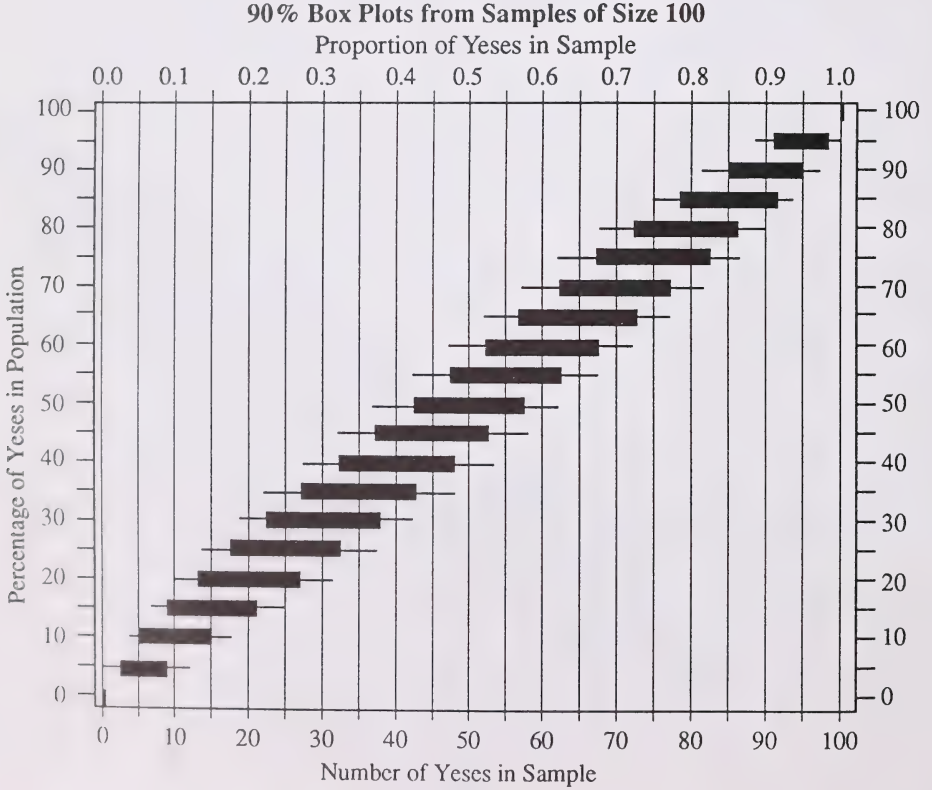

90% Box Plots from Samples of Size 80
Proportion of Yeses in Sample
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Percentage of Yeses in Population
0 10 20 30 40 50 60 70 80 90 100
0 8 16 24 32 40 48 56 64 72 80
Number of Yeses in Sample


90% Box Plots from Samples of Size 100
Proportion of Yeses in Sample
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Percentage of Yeses in Population
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100
Number of Yeses in Sample

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M1 M2 M3 M4

APPLY LABEL WITHOUT STUDENT'S NAME

MATHEMATICS 30

NAME: (LAST NAME) (FIRST NAME) DATE OF BIRTH: Y M D SEX:

PERMANENT MAILING ADDRESS: (Apt./Street/Ave./P.O. Box) (Village/Town/City) (Postal Code)

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January 1992

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MATHEMATICS 30

MULTIPLE-CHOICE

Item	Key	Item	Key	Item	Key
1	A	16	C	31	C
2	B	17	A	32	D
3	D	18	D	33	A
4	B	19	A	34	A
5	D	20	B	35	C
6	B	21	B	36	C
7	B	22	C	37	A
8	B	23	C	38	A
9	D	24	B	39	A
10	C	25	D	40	C
11	C	26	C		
12	B	27	C		
13	D	28	A		
14	A	29	D		
15	D	30	B		

NUMERICAL-RESPONSE

Item	Key
1	12
2	2.3
3	74
4	1.5
5	2.1
6	80.0
7	18.0

SAMPLE ANSWERS TO THE WRITTEN-RESPONSE SECTION

Note: The responses that follow represent ONE approach to each of the problems. During the diploma examination marking session, provision is made for considering the various approaches students may have used.

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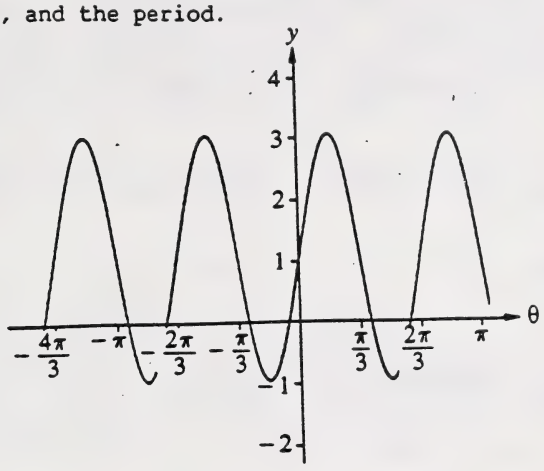
(5 marks)

2. Grace was given this graph of a trigonometric function in the form $y = a \sin(b\theta) + d$ and was asked to find the range, the amplitude, and the period.



Grace determined from the graph that the range was $\theta \in R$, the amplitude was 4, and the period was $\frac{2\pi}{3}$.

State whether you agree or disagree with each of Grace's answers and indicate why.

Grace's Answers	Agree/Disagree	Reason
range $\theta \in R$	disagree	Grace has confused the domain and range. The range is $-1 \leq y \leq 3$.
amplitude 4	disagree	The amplitude is 2. Grace forgot to take half the difference between the greatest and least values of the function.
period $\frac{2\pi}{3}$	agree	The graph begins to repeat itself every $2\pi/3$ radians.

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(5 marks) 1. A high school coach is working with 4 cheerleaders on a special routine.

a. In how many ways can the 4 cheerleaders be arranged in a row?

4! OR 24

b. In how many ways can the 4 cheerleaders be arranged in a circle?

$\frac{4!}{4}$ OR 3! OR 6

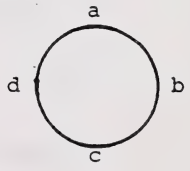
c. Explain why there are more ways to arrange the 4 cheerleaders in a row than in a circle.

Four arrangements in a row are related to the same circular arrangement. There is no starting or ending point in a circular arrangement.

For Example:

a	*b*	*c*	*d*
b	*c*	*d*	*a*
c	*d*	*a*	*b*
d	*a*	*b*	*c*

all relate to the same circular premutation



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(5 marks)

4. The Ice Haven Company wants to introduce a new frozen dessert and plans to do a survey to determine what type of dessert would be most popular. The company has advertised for a high school student to design the survey. Each applicant is to submit a short proposal suggesting how the population should be described, how a sample of the chosen population should be selected, and how the survey should be conducted.

You are one of the applicants. Write a proposal, in paragraph form, to the Ice Haven Company. Justify your suggestions.

There are an infinite number of correct answers here.

This is only one example of a response.

I am assuming the Ice Haven Company only sells its products in Alberta and I am assuming they plan to do this survey to increase their sales.

The population is Albertan grocery shoppers.

The sample would consist of Albertan grocery shoppers. The stores should be selected so that they are in both urban and rural areas and there should be a variety of large and small supermarkets. The sample would consist of people doing grocery shipping at different times of the day, and on different days. Every tenth person that walks down the frozen food isle with Ice Haven products would be chosen.

The survey would be a short questionnaire, to determine what type of new frozen desert should be marketed. I would ask:

a. What is your favorite desert? (Some may not think their favorite could be made into a frozen desert when it is possible.)

b. Is one of your favorite deserts unavailable in the frozen section?

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(5 marks) 3. a. Find the nth term, t_n, of a sequence where the first term, t_1, is 6; the second term, t_2, is 12; and the third term, t_3, is 24.

The sequence is geometric with $r = 2$.

$\therefore t_n = 6(2)^{n-1}$

OR

$\therefore t_n = 2t_{n-1}, \; t_1 = 6$

b. A sequence different from the one in part (a) has a first term, t_1 of 6 and a third term, t_3, of 24. Find the nth term, t_n.

There are many solutions to this problem.

i. The sequence could be geometric with $r = -2$.

Then $t_1 = 6$

$t_2 = -12$

$t_3 = 24$

so $t_n = 6(-2)^{n-1}$

OR

ii. The sequence could be arithmetic with $d = 9$.

Then $t_1 = 6$

$t_2 = 15$

$t_3 = 24$

so $t_n = 6 + (n - 1)9$

iii. The sequence could be neither arithmetic nor geometric. An example of such a sequence is

$t_1 = 6$

$t_2 = 14$

$t_3 = 24$

Then $t_n = (n + 2)^2 + (n - 4)$